



Project report

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Introduction

As a student, you are in contact with digital services in your everyday life to support you during your studies. For this project, our group choose Kolb's experiential learning theory [1] as our framework to work with. This theory suggests that everyone has a different learning process depending on their past experiences and during the design research process it is used as a guide to analyze and understand the data. With data from the ethnographic studies it was possible to identify what learning methods students prefer and why this is the best way to acquire knowledge. This information was important to continue working on the idea for the prototype. When creating the design solution, the points you have focused on are integrated. After the evaluation and its analysis the research question "How can students learning in higher education be supported by digital services?" to which we have worked with the design research process can be answered.

Problem identification

Throughout this project the group have used the theory "experiential learning theory" as a framework while collecting and analyzing material. Using this theory the group started early in the project to discuss how this theory can be used when gathering knowledge associated with the research question. Hevner, March, Park and Ram (2004) describes a design process as a sequence of activities that together lead to a innovative product, The first activity of our design process was to take a closer look at the research question "How can students learning in higher education be supported by digital services?", and discussed in group what kind of question we would be looking for and how we could find the answers to them. Using the experiential learning theory we seeked knowledge of how students gather knowledge and what their experiences are towards different learning methods. We knew from the start that the best way to gather qualitative knowledge for our research question, is to conduct interviews and observations. The group created interview questions that would ask the students how they learn, what they study and what their experiences are if they can reflect back to their studies and learning methods, see appendix 1. The interview questions was then asked to four students of different majors to give a wider perspective on the students learning experiences. All interviews except one was conducted face to face, which was preferred since the group thought it would give the interviews a better flow and a better understanding of the students opinions and expressions. In addition to the interviews the group conducted two observations that aimed to finding out how students learn while working on their own outside of lectures or seminars. The two observations we performed was carried out in project rooms where the student we observed worked and discussed with classmates in order to learn. We sat ourselves down behind the students and remained silent throughout the whole observation so that we could see their actions and hear them interact with the others in the room. The observations lasted for one hour each and the observers took notes of all actions and the discussions.

With the empirical data obtained from student interviews and observations it is possible to develop an understanding of what seems important to a student while studying. All interviews and observations were transcribed in order to give a clear overview of all answers and observations. With this information the group could find out codes of words from the transcribed texts that were mentioned from the empirical data to answer the research

question “how students experience learning?”. After the codes had been written down on sticky notes the group organized them to be able to see a pattern in our collected data. Using sticky notes we could easily write down keywords or sentences of information and then move the notes around to organize our data to form a pattern. The group discussed separate themes and where each code that was associated with a students learning experience could be placed. For example were codes like “group work” and “help each other” put in a theme called “social interaction” since both of these were a learning experience associated with working in social interaction.

Each theme was filled up with a different amount of codes, with social interaction being the theme with the most codes. After analyzing the empirical data we could clearly see that this theme was a major part of the students learning experience. Therefore, the aspect of social interaction emerged as our core theme from which the design question “How can digital services support social interaction while learning?” could be formulated. It sticks out that a big part of a students learning is through interacting with other students and teachers, be it to get help while learning for an exam or discuss various options for a group work and to learn through different perspectives or explanations.

In order to go more in depth with social interaction the group decided to create a mind map, see appendix 2. The mind map would give us a better overview and avoid missing out on important sub themes. With a mind map about social interaction the other suitable themes that were found through the empirical data could be connected to the core theme, social interaction. With that the group had an overview of the aspects that play an important role for a student and with further analysis how these could be taken into consideration when creating the prototype. With all the information obtained from the data the group could identify the strengths, preferences, problems and challenges that exist about social interaction learning. With this, the problem identification step was done and the group could proceed to discuss how to implement this knowledge into a digital service prototype.

Iterative design

Through the analyzes it was decided to create the design solution on the existing digital service Blackboard, which is a platform for students to get all information about the course content. The reason why we chose blackboard was because all the students we interviewed and observed actively used blackboard while learning, but also because some of these students had expressed criticisms about blackboard. Wiberg and Stolterman (2014) are saying that while a new design is created one can look to already existing services to determine if a design is a new knowledge contribution. With this knowledge the group saw blackboard as a perfect service to create a prototype for and to perhaps solve or improve the service for a better studying experience. Wiberg and Stolterman (2014) argue that new designs implemented in activities such as scenarios, sketches and modelling, bring further new ideas that could explore new design spaces. These activities was implemented in order for the group to generate as many ideas as possible and to explore additional design spaces. Afterwards the group discussed and reflected on these scenarios and sketches what is useful for the later design if you want to create a helpful interaction for students through the upload documents on Blackboard. Using the experiential learning theory we decided to create a second iteration of scenarios and sketches in order to provide additional and

improved ideas based on our reflections from the first iteration of scenarios and sketches. The intention of a scenario in this project would be to demonstrate the learning process a student goes through while engaging in social interaction through a digital service. The sketches are the first step in our creation of the interface for the prototype and are used to clarify a defined idea of how a student will use the functions while learning. It is an important step to do scenarios and sketches before starting to design the prototype to collect different ideas of functions and elements that are useful, and to sort out what appears optimal in the imagination but ultimately cannot be implemented. This method would also work as a filter for our prototype design, by focusing on a particular region within an imagined or possible design space i.e. social interaction (Lim, Stolterman, & Tenenberg, 2008).

The idea was to design a digital service that would support the social interaction and use it in a way that would give a better learning experience for students. Lim et al. (2008) says that it is a skill for designers to only implement the qualities of interest into the prototype. In our prototype the group has chosen to only design the functions that is relevant to answer our knowledge question. The prototype was developed with prototype tool figma [2]. Using Figma, the group could prototype digitally with easy editing and without economic limitations. Using a digital tool to visualise a design idea with a complex and detailed level of interactivity instead of prototyping on paper, may prove to be more cost effective (Lim et al. 2008). The group tried to design the prototype by including all the themes that had been created in the mind map about social interaction. The concept for our prototype is to give students a way to share knowledge through a comment function in digital documents such as lecture presentations and articles. The function to be able to comment and view comments from teachers is an example since “communication with teachers” was also an important part for students learning through social interaction. Before opening the documents you can see the name of the document, what lecture it was, what date it was added, how many comments there are in the document and how many notes that have been shared. The group also created a function that enable students to share notes and other useful material to give them more options in how they can learn from each other. These notes could for example be used to share knowledge between students, give new perspectives of learning and update students on the course if they couldn't attend a lecture. Every student and teacher associated with the course can comment in the documents and give advices or share their notes in a separate folder.

This prototypes goal is to allow students to interact with each other by sharing knowledge from different perspectives and get discussions about the content in order to help students in the learning process. Lim et al. (2008) argue that the best prototype is one that in the simplest way, makes all aspects of a design idea visible and measurable. When designing, the group has taken this into account when adding various elements into the prototype, these elements all connected to solving the design problem. It was significant to try creating an environment of privacy and wellbeing with filter options to ask who you would like to ask or answer and with who you want to share the informations and from who to get them. With this everyone should be able to participate in the function “discussions and notes”. The further development of Blackboard should become a part of students learning.

Evaluation

Hevner et al. (2004) argues that evaluation is a crucial part of a process and that a prototype can be evaluated in multiple ways e.g. on functionality, usability or accuracy. The group decided that since the goal of the evaluation was to find an answer to the question "How can digital services support social interaction while learning?" the evaluation had to generate a lot of different perspectives and room for motivation on these perspectives. A focus group was decided to be carried out in order to answer the question. Before this the group carried out a heuristic evaluation within the design team. The prototype was tested against Nielsen ten heuristics [3] that aim to find out how well the prototype meet specific standards, so that after evaluate it the prototype can be modified to meet the heuristics. The purpose of this was to ensure that the students in the focus group do not only pay attention to the interfaces but rather that they perceive the intent of the functions in the prototype.

During the preparation for the focus group, the knowledge already acquired that was obtained during the problem identification process was used and integrated. Discussions during the whole evaluation are a significant part, because this is how students are getting knowledge from different perspectives and develop other thoughts. Before this preparation it was important to have evaluation criteria to know your aim and what you want to get from this evaluation to be able to answer the main research question. In order for us to create evaluation criteria we broke down the word social interaction into five parts: discussion, questions, answers, safety and sharing.

The focus group will be carried out by three students and two project members who moderated the session. The focus group should follow the sequence that should first be found out what social interaction in digital services was to the participants, this was done with the help of a mind map and a discussion between the participants. In order to guide the participants in the right direction, the group members prepared questions to go deeper in the functions of digital services which simplify and promote social interaction. The aim of the mind map was to get the participants thinking about social interaction in digital services and to stimulate the next step that was testing the prototype. With a task driven test the participants individually tested the prototype with nine given tasks while doing the "think out loud method" with the intention of getting more details on the research question. During the test the participants were observed to see how they worked with the prototype and the reaction to how user-friendly the prototype was and how they understood the functions. After testing the prototype the participants discussed the prototype in relation to the mind map and given questions that aimed them to answer "How can digital services support social interaction while learning?". With sticky notes the participants could write down what elements in digital services and the prototype were useful and which ones were a problem or could be improved. After the focus group has been carried out, it should be possible to get a picture of what is achieved with the design solution, and if all points of the the evaluation criteria are met and argued for.

Discussion

The evaluation we set up was a focus group built on three parts: a mind map, a task driven test and a discussion. The evaluation aimed to find out "how a digital service can support social interaction while learning". In order for us to make clear what social interaction includes, we broke social interaction down into smaller points: discussion, questions,

answers, safety and sharing. These five points became our evaluation criteria that we later used to analyze the findings from the focus group.

The focus group that was carried out consisted of three parts. In the first part the participants were asked to make a mind map around what social interaction in digital services was to them. While analyzing the data from the mind map the group found that most points in the mind map referred to different social digital services, this data was interesting but not relevant to our knowledge question. In order to gather more data that connected to our knowledge question, we thought that the question to the participants needed to change, currently it is too general and refers to social interaction in digital platforms with no specific direction. However, we still find value in the mind map as a part of the evaluation. It was a good way to set the participants mode and to get them thinking about social interaction in digital platforms. The next part of the evaluation, the task driven test aimed to letting the participants get to know our idea and prototype in order for them to later give feedback on what elements were good and less good. The think out loud method was used during the test and it gave interesting points connected to the interface of the platform. This was expected and needed to be done in order for the final discussion to be as giving as possible. The discussion was the part where the majority of our findings were identified, the participants got sticky notes and on their own initiative they decided to color code keywords into negatives and positives. Since the prototype could visualize the interactivity with the interface we were worried that the feedback from the focus group would only touch on this area. The way that we chose to manifest the values of our prototype would inevitably affect their perceptions of the prototype (Lim et al. 2008). However with an open discussion and iteration of questions the group thought that the feedback could make the focus group touch on a larger area about the concept and artifact itself instead of only interactivity. The discussion had a good flow, but while listening to the recording afterwards it was clear that there were some parts of the discussion where the group members answered questions instead of letting the participants give us their opinions and thoughts. This might have been a mistake that could have made the feedback from the focus group biased, but at the same it might have helped the focus group to discuss and explore more areas about the prototype and concept.

With the focus group completed we analyzed the material with our design question and the evaluation criteria as tools. We found that only one of our five evaluation criteria were completely fulfilled, that was the first criteria, discussion. The platform can, as it is today, give all users a space to participate in discussion. Since the fundamental idea of the service is to make a space where students can share knowledge this criteria was important to fulfill. However Höök and Löwgren (2012) explains that sometimes people are most interested in a personal account from one or two persons recommending an item, meaning that a way to follow specific students instead of everyone could have been a useful design iteration. The most critical criteria was safety where we found that we missed several elements in the platform in order for students to feel safe while learning and sharing. We reflect that this criteria is essential to fulfill in order for the platform to support the students learning. The remaining three criteria, questions, answers and sharing was only half fulfilled, there were elements included in the platform regarding these that were good, but also several elements that were missing. In order to find out if our design had novel ideas we could also follow the criterias mentioned by Wiberg and Stolterman (2014). Through discussion with the focus

group we could argue for what is considered an addition of a new element to a known generic model manifested in a design i.e. the comment function in documents on blackboard. Hevner et al. (2004) says that an artifact is complete when it can satisfy the problem it was meant to solve. The goal with the evaluation was to find answers to the question "How can digital services support social interaction while learning?", we can use that question as our problem. Even though our evaluation criteria have not been completely met we still argue that the problem has been solved since we have a knowledge contribution. It is listed in the chart below, which part of each criteria is fulfilled and which is not.

Evaluation criteria	Fulfilled	Not fulfilled
1. Discussion - Does the prototype give the user a chance to discuss and also make it a place where every student can participate?	All students can participate in discussion. Students get access to discussion with associated material.	
2. Questions - Can the students ask what they are wondering?	Students can ask a question with a reference to a text.	Students want to be able to mention teachers name and ask a direct question. The teacher will be notified. Students want to be able to ask questions anonymously.
3. Answers - Does it give the student opportunity to find help with what they struggle with?	Students should not be able to answer comments anonymously in order to trace the source of all the answers, which could decrease incorrect or mean answers	Students want to be able to like comments, the more likes a comment has the more trustworthy the students feel it would be.
4. Safety - Is the service a safe environment for students to use while learning?		Students want to be able to ask questions anonymously so that they don't get put on the spot. Students want to have an ban system or administration to reduce/remove spam or harassment (report comments).

5. Sharing - Do the service provide the user a space to share knowledge and learn from shared knowledge?	<p>Students can choose to share comments to specific groups only.</p> <p>Students can use document on cloud function so that nothing saves locally on their computer.</p>	<p>Students want to be able to create groups for their own.</p> <p>Students want to be able to pin comments and save them all in one place.</p> <p>Students want to be able to refer to earlier comments.</p>
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Conclusion

This project has aimed to answer the question “how students learning in higher education can be supported by digital services”. Throughout this project we have been working with the experiential learning theory as a framework for our ethnographic studies, prototype creation and evaluation. In the ethnographic studies we found a correlation between how students experience learning and social interaction, and the strongest element of social interaction was discussion. The reason of this is that exchanging knowledge between other students is a learning process itself since students have to gather an understanding to be able to share their knowledge with other students. The theory suggest that people learn through reflection and iteration and since discussion includes both these elements we chose to digitalise discussion and build it into the prototype. The findings we have made are based on the ethnographic studies and the evaluation with the focus group.

The main contribution from this project consists of two parts, the first part is the identification of which specific elements students value in this digital platform in order to feel that they are supported while learning. The major values that we have identified is that students want to be in control of who they share information with and what information they receive. They do not want information that is irrelevant for them which could make them lose focus or give an overflow of information. Students need an option of filtering information in order to share and receive information that is relevant to them. This filter function is also supported by the statement from Höök and Löwgren (2012), saying that sometimes user only want to follow advice from specific groups of people or from experts in the field, i.e. teachers. They need to be able to create anonymous questions, so that they feel more confident about asking questions without feeling judged. Finally a report function on comments is needed to maintain a clean digital learning environment by reducing inappropriate content or harassment. The second part is the identification of how students in higher education are learning today. That is the identification of knowledge exchanged between students and the realisation of how this experience can be digitalised to encourage learning through social interaction. These findings can be used as a framework for future designs that aims to support students learning in higher education on digital platforms, with connection to social interaction.

Appendix 1

Interview guide

How can digital services support different types of learning?

1. What program are you studying in?
2. How long have you studied?
3. Tell me about your program
4. Tell me about the type of learning formats in the course you have right now
 - Lectures
 - Group-Work
 - Practical work
 - You mentioned ... and ... Do you find that educating? What is good or bad?
5. If you would be sick during a lecture in this course, how do you get information/catch up?
 - Friends - why do you ask friend, face to face, Facebook (how)
 - Blackboard - what if it is not on blackboard
6. Describe your typical day when you are preparing for an exam and the learning area/your surroundings.
 - When?
 - Studying in group
 - Alone
 - Why did you prepare in this way?
- 6b. Can you describe the last group- work you did?
 - How do you communicate with group-members?
 - How do you organize your work?
 - How do you gather information and learn?
 - Google drive
 - Messenger
- 6c. If you work alone, how do you gather information and which methods do you use to learn.
 - Read
 - Videos
 - Brainstorm
7. Is there a difference between your past learning experience to the ones you have now at university?
 - Among these learning experiences, which do you find most educating for you?
 - Why
8. When you study, are there any recurring problems that you have?
 - Is something hard to understand or learn?
 - Or did you run into a problem?

Appendix 2



References

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